

## Operator's Manual

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## LDX-2 LOOP POWERED TRANSMITTER



One Omega Drive, Box 4047  
Stamford, CT 06907-0047  
(203) 359-1660 Telex: 996404 Cable: OMEGA FAX: (203) 359-7700



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OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of 13 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

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And International TELEX: 996404 FAX: (203) 359-7700

#### Return Requests/Inquiries

Direct all warranty and repair requests/inquiries to OMEGA Customer Service Department, telephone number (203) 359-1660. BEFORE RETURNING ANY INSTRUMENT, PLEASE CONTACT THE OMEGA CUSTOMER SERVICE DEPARTMENT TO OBTAIN AN AUTHORIZED RETURN (AR) NUMBER. The designated AR number should then be marked on the outside of the return package.

To avoid processing delays, also please be sure to include:

1. Returnee's name, address, and phone number.
2. Model and Serial numbers.
3. Repair instructions.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. That way our customers get the latest in technology and engineering.

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## SECTION 1 HANDLING

This LVDT Transmitter is subjected to strict quality control procedures throughout manufacture and assembly and is well-protected during transit. We must be advised immediately if it is damaged when received.

The ABS plastics enclosure of the boxed version is impact resistant, ie, it has been designed to withstand knocks in an industrial environment. The electronics require more careful handling. Please avoid dropping the unit or touching the exposed printed circuit board with screwdrivers or fingers during installation.

## SECTION 2 UNPACKING

Remove the Packing list and verify that all equipment has been received. If there are any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

### NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

## SECTION 3 STORAGE

If the signal conditioner is not to be installed immediately, we recommend that it be returned to its original packing for storage purposes. The storage environmental temperature should be within the range -40 to +80°C (-40 to 176°F).

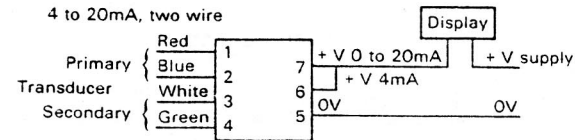
## SECTION 4 GENERAL DESCRIPTION

The Model LDX-2 Transmitter is designed for use with ac inductive-type LVDT displacement transducers. It has a dual function: (1) its onboard oscillator derives power from the supply and produces a sine wave carrier to drive the transducer primary winding; (2) its amplifier, demodulator and filter circuit conditions the transducer output and a voltage-to-current converter provides the dc milliamp current drive. The transmitter is especially suitable where a readout is required at a substantial distance from the transducer and for interfacing with a controller or computer in automated manufacturing processes.

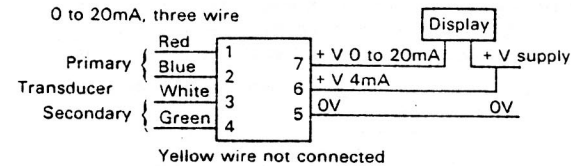
LDX-2 Transmitters will operate with most of OMEGA's LD200 & 300 transducers. (See Tables 1 and 2 in section 9.0 and 10.0 for a full list). Switches on the printed circuit card are used to set up the conditioner for a specific transducer type and onboard Span/Zero controls are provided for calibration purposes.

A 4-20mA Transmitter is suited to current-driven indicators and provides a direct compatible interface with computerized data acquisition and control systems. The Transmitter (Figure 1) draws 4mA to

operate the electronics while the position of the transducer controls a 0-16mA current sink wired in parallel. Thus, the position of the transducer is indicated by the current consumption and a broken cable is identified by zero current. This inherent ability for fault indication, together with its low susceptibility to electrical noise and cable resistance, and the need for only two wires make the 4-20mA Transmitter ideal for use in industrial environments.



A 0-20mA Transmitter (Figure 2) works on the same principle, but without linking the two current drives. It can therefore be used with a simpler indicator although it needs a third wire.



## SECTION 5 PHYSICAL DESCRIPTION

The LDX-2 Transmitter is supplied enclosed in a grey ABS plastic box measuring 4.75 in. x 3.14 x 2.16 deep with sealed cover and cable entries, one for the transducer wire and the other for the supply cable. Cable glands accept wires from 0.04 in. to 0.20 in. diameter.

## SECTION 6 MOUNTING

The LDX-2 has 0.165 in. diameter mounting holes on 4.25 in. x 1.97 in. centers. These mounting holes are segregated from the electronics by partitioning in the box moulding, which may thus be secured to any surface, using only two screws without affecting the sealing.

### NOTE

Two securing screws and two nuts for alternative fixing to a DIN46277-1 rail are supplied loose with the transmitter.

## SECTION 7 WORKING ENVIRONMENT

Model LDX-2 Transmitters will operate in environmental temperatures from 0 to 70°C (32 to 158°F).

Provided the lid and cable entry seals have been properly applied, the enclosure will withstand low pressure water hosing. This version is therefore ideally suited for installation in dirty or damp industrial environments or in the open where it may be exposed to rain.

## SECTION 8 ELECTRICAL SAFETY

Under normal circumstances, you are unlikely to come to any real harm from the low voltages and currents used in the LDX-2 Transmitter. However, the electrical connections should be made with the power off. The switch settings, Span and Zero control adjustments can be undertaken with the power on, but with care to avoid damage to the electronics.

## SECTION 9 WIRING

Cable connections are made to the boxed PCB by means of seven screw terminals located as shown in Figure 3.

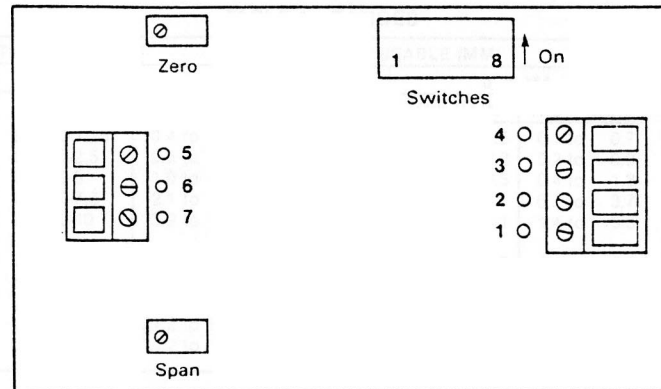


Figure 3. Layout of Box

Unscrew and remove the lid. Remove the plastic nuts from the cable entries, taking care not to lose the sealing washers. Insert each cable through holes in one nut, washer and gland body leaving sufficient length inside to make the connections. On completion of wiring, the nuts are replaced and finger tightened to make the seal. For thinner than normal cabling it may be necessary to apply half a turn on the nut after finger tightening.

### 9.1 POWER SUPPLY

A DC power supply of 13V to 48V and up to 30mA is required. Because the transmitter is frequently installed at a consider-

able distance from the indicator/control point, there is a possibility that the supply cable connections will be reversed. The transmitter is protected by an internal diode against possible damage caused by reversed polarity.

For correct operation 13V must be achieved at the transmitter at 20mA full scale, the total resistance of the installed indicator and cable must not be too large. As a general guide do not exceed the value of R calculated using the following formula:

$$R \leq \frac{V_s - 13}{0.02} \text{ ohms}$$

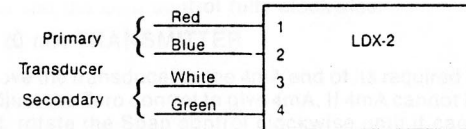
Where  $V_s$  = actual power supply voltage

For example, if  $V_s = 24V$ ,  $r \leq 550$  ohms.

### 9.2 TRANSDUCER CONNECTION

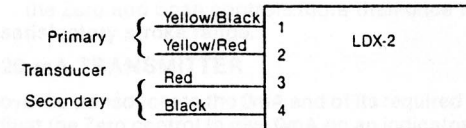
Connect the transducer primary and secondary winding wires to terminals 1 to 4 in accordance with the color coding in Figure 4. Connections should be made according to the type of transducer being used and color coding of wires. In both cases, these transducer connections will give a rising current output for an outward movement of the armature. If the current is required to increase on the inward stroke, the secondary connections shown in Figure 4 must be reversed.

Figure 4a - LD 300 Series



Note: Yellow wire if provided is not connected.

Figure 4b - LD200 Series



Note: Green and Blue wires should be connected together only.

### 9.3 4-20mA TWO-WIRE TRANSMITTER

Connections for the transducer cable are as before. In the case of this supply cable, make connections to terminals 5 and 7 as shown in Figure 1 and additionally wire terminal 6 to terminal 7 inside the enclosure.

## 9.4 0-20mA THREE-WIRE TRANSMITTER

Connect the power supply cables as shown in Figure 2, note that the third wire from pin 6 is now connected to the power supply and not pin 7.

## 10.0 SELECTABLE GAINS

Switches and adjustment control can be identified using Figure 3 or the internal label of the LDX-2 box. The switches move in the direction of the point for "ON". A ballpoint pen or small screwdriver can be used for this purpose.

The amount of signal amplifications will depend upon the sensitivity of the transducer being used with the transmitter. The amplifier gain can be set to two different ranges, selected by means of switch 8. Switch ON gives high gain and switch OFF gives low gain.

The span control provides for fine gain adjustment, it gives a variation of 5:1 and the resultant stroke ranges available for use with each transducer are given in Table 1.

TABLE 1 RANGES

TRANSDUCER	± RANGE USABLE (MM)			
	4-20 MA		0-20 MA	
	LOW GAIN	HIGH GAIN	LOW GAIN	HIGH GAIN
LD200-1.25	0.4 to 2.0	0.1 to 0.6	0.5 to 2.5	0.1 to 0.7
LD200-2.5	0.5 to 2.5	0.1 to 0.7	0.6 to 3.2	0.2 to 0.9
LD200-5	1.0 to 5.2	0.3 to 1.5	1.3 to 6.5	0.4 to 1.8
LD200-7.5	2.1 to 10.4	0.6 to 2.9	2.6 to 13	0.7 to 3.7
LD200-10	3.9 to 19.3	1.1 to 5.5	4.8 to 24.1	1.4 to 6.8
LD300-15	3.1 to 15.6	0.9 to 4.4	3.9 to 19.5	1.1 to 5.5
LD300-25	5.3 to 26.5	1.5 to 7.5	6.7 to 33.2	1.9 to 9.4
LD300-50	11.4 to 57.0	3.2 to 16.1	14.3 to 71.3	4.1 to 20.2
LD300-100	21.2 to 106.0	6.0 to 30.0	26.6 to 132.6	7.6 to 37.6
LD300-250	14.2 to 71.4	50.5 to 252.4	18.0 to 90.0	63.0 to 316.0

### NOTE

The upper gain limit will be set by the transducer. For example, although the 4-20mA electronics with low gain will allow an LD200-1.25 transducer to be used over the stroke range ±2.0mm, it is only a 1.25mm transducer, so ± 1.25mm is the practical limit.

Sufficient zero adjustment is provided so that the minimum range can be used anywhere in the maximum range. For example, with an LD300-100 you can get a 4-20 ma signal relative to a 20mm displacement (the minimum range) with a reference point anywhere in the range of + - 109mm (the maximum range).

## SECTION 11 TRANSDUCER CONFIGURATIONS

Switches numbered 1 to 7 are used to get the LDX-2 to suit the type of transducer being used. The positions are listed in Table 2. SW8 controls the gain and is shown in the best position to achieve full scale output for full transducer displacement.

TABLE 2. SWITCH SETTINGS

TRANSDUCER	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
LD200-1.25	OFF	OFF	ON	ON	ON	ON	ON	OFF
LD200-2.5	OFF	OFF	ON	ON	ON	ON	OFF	OFF
LD200-5	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
LD200-7.5	OFF	OFF	ON	ON	ON	ON	OFF	OFF
LD200-10	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
LD300-15	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
LD300-25	OFF	OFF	ON	ON	ON	ON	OFF	OFF
LD300-50	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
LD300-100	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
LD300-250	OFF	OFF	ON	ON	OFF	OFF	ON	ON

## SECTION 12 CALIBRATION

First check that the transducer and power supply cables have been correctly wired to the transmitter as previously described. Using a small screwdriver, turn the Span control fully anti-clockwise (counter-clockwise) and the Zero control fully clockwise.

### 12.1 4-20 mA TRANSMITTER

Move the transducer to the 4mA end of its required travel and adjust the Zero control to give 4mA. If 4mA cannot be obtained, rotate the Span control clockwise until it can.

Move the transducer to the 20mA end of its required travel and adjust the Span control to give 20mA. If the output stays at 4mA or falls, again the transducer white and green connections are probably reversed. It will prove necessary to adjust the Zero and Span controls more than once to achieve a satisfactory stroke range.

### 12.2 0-20 mA TRANSMITTER

Move the transducer to the 0mA end of its required travel and adjust the Zero control to give 0mA on an indicator. The control should be set for just 0mA since the current cannot go negative and a wide range of Zero control may produce 0mA. It may be necessary to slightly adjust the Span control clockwise, in association with Zero control, in order to achieve 0mA if the transducer is being operated over a small range at one end of its travel.

Move the transducer to the 20mA end of its required travel and adjust the Span control to give 20mA. If the current stays at 0mA, try reversing the white and green transducer connec-

tions. It may prove necessary to adjust the Zero and Span controls more than once to achieve a satisfactory stroke range.

### SECTION 13 SPECIFICATIONS

Power Supply	13-48V DC up to 30mA
Supply Protection	Protected internally against reversed connections
Transducer Drive	0.9V rms at 5kHz nominal, 13kHz switchable
Non-Linearity	Better than 0.02%
Frequency Response	25Hz cut off, critically damped
Output Ripple	0.1% rms maximum
Effect of Supply Change	Negligible
Effect of Temperature Change	Zero 0.01% per °C typical Span 0.01% per °C typical
Longterm Stability	Zero 0.2% per year typical Span 0.3% per year typical
Oscillator Protection	Open and short circuit protected
Transducer Sensitivity Range	30 to 530mV/V in 2 coarse gain positions
Range of Gain control	3.5:1 switched 5:1 adjustable
Range of Zero control	Up to 100% on maximum gain

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